a wide band electronic excitation signal [and comprising] involving the steps of exciting the system with a low-power, wide band input signal that has a rich frequency content over a wide band and using a stochastic process to derive a system transfer function over the excitation signal bandwidth.

IN THE CLAIMS

Please cancel Claim 17 and rewrite as new Claims 72 and 73. Please cancel Claim 46 and rewrite as new Claim 74. Please cancel Claims 29 and 35 and rewrite them as new Claims 75 and 76 respectively. Please cancel Claims 64, 65, 66 and 68. Please amend Claim 1-6, 8-10, 12-16, 18-28, 30, 31, 34, 36-60, 62,63, 67 and 69-71 as follows:

A2

1. (Amended) A method of measuring transfer functions of a physical system using a wide band excitation signal comprising the steps of:

a) exciting at a low power [the] said physical system with [a low power] said wide band excitation signal as an input signal; and,

b) using a stochastic process to derive a system transfer function over the [excitation signal bandwidth] width of said wide band excitation signal.

2. (Amended) The method of Claim 1 wherein said low power, wide band input signal is a modulated signal spread over a continuous band.

3. (Amended) The method of Claim 2 wherein said low power, wide band input signal is frequency modulated.

4. (Amended) The method of Claim 2 wherein said low power, wide band input signal is amplitude modulated.

a2 cont.

5. (Amended) The method of Claim 2 wherein said low power, wide band input signal is phase modulated.

6. (Amended) The method of Claim 1 wherein said low power, wide band input signal is an ambient signal.

8. (Amended) The method of Claim [4] 7 wherein said non-parametric technique includes the Welch process.

a3

9. (Amended) The method of Claim [4] 7 wherein said non-parametric technique includes the Barlette process.

10. (Amended) The method of Claim [4] 7 wherein said non-parametric technique includes the coherence function.

12. (Amended) The method of Claim [5] 11 wherein said parametric technique includes adaptive filtering.

a4

a4 cont.

13. (Amended) The method of Claim [5] 11 wherein said parametric technique includes least squares method.

14. (Amended) The method of Claim [5] 11 wherein said parametric technique includes Pade approximation.

15. (Amended) The method of Claim [5] 11 wherein said parametric technique includes Prony's method.

16. (Amended) A method of Claim [5] 11 wherein said parametric technique includes iterative prefiltering.

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a5

18. (Amended) The method in Claim [17] 72 wherein only a single data recorder/processor is used.

19. (Amended) The method in Claim [17] 72 wherein two data recorder/processors are used.

20. (Amended) The method in Claim [17] 72 wherein three or more data recorder/processors are used.

a5 cont.

21. (Amended) The method in Claim [17] 72 wherein [the] said telemetry network uses digital signals.

22. (Amended) The method in Claim [17] 72 wherein [the] said telemetry network uses analog signals.

23. (Amended) The method in Claim [17] 72 wherein [the] said telemetry network uses fiber optics links.

24. (Amended) The method in Claim [17] 72 wherein [the] said telemetry network uses RF or microwave links.

25. (Amended) The method in Claim [17] 72 wherein [the] said telemetry network uses optical links.

26. (Amended) The method in Claim [17] 72 wherein [the] said telemetry network uses hard wire [(conducting cable)] links.

27. (Amended) The method in Claim [17] 72 wherein [the] said telemetry network uses a daisy chain [(closed loop)] architecture.

a5 CON'D

28. (Amended) The method in Claim [17] 72 wherein [the] said telemetry network uses a star [(spokes)] architecture.

29. (Amended) The method in Claim [17] 72 wherein [the] said telemetry network is selected from the group consisting of digital signals[,] and analog signals[, fiber optic links, RF, microwave links, optical links, hard wiring links, daisy chain architecture, star architecture and any combination thereof].

a6

30. (Amended) The method of Claim [17] 72 wherein said frequency synchronization signal is integrated with [the data stream] said received and recorded wide band excitation input signals to produce a single signal transmitted through [the] said network.

31. (Amended) The method of Claim 30 wherein [the] said integration is performed via pulse width modulation.

a7

34. (Amended) The method of Claim [17] 72 wherein said frequency synchronization signal is not integrated with [the data stream] said received and recorded wide band excitation input signals so that two separate signals are transmitted through [the] said network.

35. (Amended) The method of Claim [17] 72 wherein said synchronization signal is

transmitted via [the] methods selected from the group consisting of pulse width modulation, frequency division multiplexing, and time division multiplexing [, and any combinations thereof].

a8

36. (Amended) The method of Claim [17] 72 wherein said spatially distributed data recorders/processors down-convert the received signals.

37. (Amended) The method of Claim [17] 72 wherein said spatially distributed data recorders/processors store the received signals in digital format.

38. (Amended) The method of Claim [17] 72 wherein data recorders/processors store the received signals in analog format.

39. (Amended) The method of Claim [17] 72 further including the step of inserting one or more waveform synthesizers in said telemetry network.

40. (Amended) The method of Claim 39 [whereas the] wherein said one or more waveform synthesizer synthesizes a modulated signal about a specified center frequency.

41. (Amended) The method of Claim [39] 40 [whereas the] wherein said modulated signal is fully programmable.

a8 cont.

42. (Amended) The method of Claim 40 [whereas the] wherein said modulated signal is frequency modulated.

43. (Amended) The method of Claim 40 [whereas the] wherein said modulated signal is amplitude modulated.

44. (Amended) The method of Claim 40 [whereas the] wherein said modulated signal is phase modulated.

45. (Amended) The method of Claim 40 [whereas the] wherein said waveform synthesizer uses up-conversion to shift the modulated signal and its specified center frequency to [the desired] a new frequency about a new specified center frequency.

a9

47. (Amended) The method of Claim [46] 74 [whereas the] wherein said system under test is not physically distributed.

48. (Amended) The method of Claim [46] 74 [whereas the] wherein said excitation signal consists of ambient radiation.

49. (Amended) The method of Claim [46] 74 [for estimating] wherein said transfer function is an electromagnetic transfer [functions] function.

50. (Amended) The method of Claim [46] 74 [for estimating] wherein said transfer function is an acoustic transfer [functions] function.

a9 cont

51. (Amended) The method of Claim [46] 74 [for estimating] wherein said transfer function is a seismic transfer [functions] function.

52. (Amended) Apparatus for obtaining data for measuring the transfer function of a physical system comprising:

a) a waveform synthesizer for generating a synthesized low-power, wide band waveform and exciting [the] said physical system with said waveform as [a low-power, wide band] an input signal [that has a rich frequency content over a wide band];

b) a first data recorder/processor for sampling said low-power, wide band input signal;

c) second and third data recorder/processors located at spatially distributed locations within said system;

d) digital fiber optic telemetry for digitally interconnecting each of said first, second and third data recorder/processors and said waveform synthesizer;

e) an acquisition control computer connected to said first, second and third data recorder/ processors and said waveform synthesizer in a network arrangement;

f) a synchronization signal generator connected to said network arrangement; and,

g) [a] controller means for simultaneously commanding said waveform synthesizer to broadcast said low-power, wide band input signal to excite the physical system and to send a synchronization signal through said network arrangement to cause said first data recorder/processor to sample said low-power, wide band input signal, to cause said second and third data recorders/processors to measure and record the signals received [from the] in said physical system [in response to] from said low-power, wide band input signal, and to cause said first, second and third recorder/processors to convert [the] said measured and recorded signals received therein to digital format and to send said [code] digital format in synchronized form through said network arrangement to said acquisition control computer for later processing in said acquisition control computer to a transfer function.

a9 cont

53. (Amended) The apparatus of Claim 52 wherein said waveform synthesizer synthesizes a fully programmable 3 MHz modulated excitation signal about a center frequency located in the range of about 0-999 MHz [center frequency]

54. (Amended) The [method] apparatus of Claim 53 [whereas] wherein said waveform synthesizer is adapted to generate [the synthesized waveform is] a pseudo-noise excitation

a9 cont

modulated signal.

55. (Amended) The method [method] apparatus of Claim 53 [whereas] wherein said waveform synthesizer is adapted to generate [the synthesized waveform is] a frequency modulated excitation signal.

56. (Amended) The [method] apparatus of Claim 53 [whereas] wherein said waveform synthesizer is adapted to generate [the synthesized waveform is] an amplitude- modulated excitation signal.

57. (Amended) The [method] apparatus of Claim 53 [whereas] wherein said waveform synthesizer is adapted to generate [the synthesized waveform is] a phase-modulated excitation signal.

58. (Amended) The [method] apparatus of Claim 53 [whereas] wherein said waveform synthesizer is adapted to generate [the synthesized waveform is] a narrowband [CW] continuous wave excitation signal.

59. (Amended) The [method] apparatus of Claim 53 [whereas] wherein said waveform synthesizer is adapted to generate [the synthesized waveform is the] a synthesized waveform [has been synthesized] using a 12-bit digital-to-analog converter sampled at 12

MHz.

a9 cont

60. (Amended) The [method] apparatus of Claim 53 wherein said waveform synthesizer is adapted to up-convert [the synthesized waveform is] the modulated signal [is up-converted] to [the center frequency of interest] a modulated excitation signal about a specified center frequency.

a10

62. (Amended) The apparatus of Claim 52 wherein said data recorder/processors [uses] use a two-step, down-conversion [techniques] technique for shifting the modulated excitation signal to a 15 MHz center frequency.

63. (Amended) The apparatus of Claim 54 wherein said data recorder/processors [uses] use a 12-bit analog-to-digital [converters] converter sampled at 12 MHz to digitize and store [the] said modulated excitation signal.

a11

67. (Amended) The apparatus of Claim 52 wherein said [telemetry] network arrangement is configured as a daisy [chained] chain digital fiber optics network arrangement.

a12

69. (Amended) The apparatus of Claim 52 wherein said [frequency] synchronization signal generator is a 3 MHz local oscillator [located in the interface module].

a17 cont.

70. (Amended) The apparatus of Claim 52 wherein said synchronization signal is transmitted through [a] said interconnected digital fiber optic telemetry [fiber optics line] with an analog bandwidth of 125MHz.

71. (Amended) The apparatus of Claim 52 wherein said synchronization signal is integrated with said signals received in said physical system from said low-power, wide band input signal [the data stream] using pulse width modulation.

a13

72. (New Claim) A method of acquisition and signal transmission through a plurality of spatially distributed locations comprising the steps of:

a) exciting at a low power a physical system with a wide band excitation signal as an input signal;

b) locating a data recorder/processor at each spatially distributed location;

c) interconnecting each said spatially distributed data recorder/processor to an acquisition control computer using a telemetry network;

d) sending a frequency synchronization signal through said telemetry network;

e) simultaneously receiving and recording said wide band excitation input signals in said data recorders/processors at each spatially distributed location;

a13 cont.

f) sending said recorded signals to said acquisition control computer via said network; and,

g) using a stochastic process to derive from said recorded signals a system transfer function for said physical system over the width of said wide band excitation signal.

73. (New) The method of Claim 72 including the further step of storing said simultaneously received and recorded wide band excitation input signals in said data recorders/processors at each spatially distributed location.

74. (New) A method of estimating the transfer function of a system comprising the steps of:

a) exciting at a low power said system with wide band excitation signals as input signals;

b) distributing data recorder/processors at various locations about said system;

c) interconnecting each said data recorder/processor to an acquisition control computer using a telemetry network;

d) sending a frequency synchronization signal through said telemetry network;

e) simultaneously receiving and recording said wide band excitation; input signals and said frequency synchronization signal in said data recorders/processors at each said distributed location;